

C L A I M S

1. A method of injecting lift gas into a production conduit of an oil well via one or more downhole gas lift flow control devices which each comprise:

- a tubular valve housing comprising a flow passage having an upstream end which is connected to a lift gas supply conduit and a downstream end which is connected to the interior of the production conduit;
- a flapper type valve body which is pivotally connected to the valve housing and is arranged in the flow passage such that if the valve body is pivoted in the open position the valve body is oriented substantially parallel to the flow passage and that if the valve body is pivoted in the closed position the valve body is oriented substantially orthogonal or perpendicular to the flow passage and is pressed against a ring shaped valve seat, thereby blocking passage of fluids through the flow passage;
- a valve protection sleeve which is slidably arranged in the flow passage between a first position wherein the sleeve extends through the ring-shaped valve seat, whilst the valve body is pivoted in the open position thereof, thereby protecting the valve seat and valve body against wear by the flux of lift gas or other fluids and a second position wherein the sleeve extends through the section of the flow passage upstream of the valve seat, whilst the valve body is pivoted in the closed position thereof; and
- a flow restrictor forming part of the valve protection sleeve, which is dimensioned such that the

flux of lift gas or other fluids flowing through the flow restrictor creates a pressure difference which induces the sleeve to move towards the first position.

2. The method of claim 1, wherein the sleeve has a tapered section where the outer diameter of the sleeve is gradually reduced in downstream direction of the sleeve and a first flexible sealing ring is arranged in the housing upstream of the valve seat, such that the outer surface of the tapered section of the sleeve is pressed against the inner surface of the sealing ring when the sleeve is in the first position thereof, thereby providing a fluid tight seal in the annular space between the tapered section of the sleeve and the tubular valve housing when the sleeve is in the first position thereof and such that said first sealing ring only loosely engages the tapered section of the sleeve when the sleeve is in the second position thereof.

3. The method of claim 1 or 2, wherein the second flexible sealing ring is arranged in the tubular housing downstream of the first sealing ring, which second sealing ring is configured as a stop for the sleeve when the sleeve is moved in the first position thereof.

4. The method of claim 2 and 3, wherein the first and second sealing rings are made of an elastomeric material and define a sealed annular enclosure in which the flapper valve body and seat are arranged when the sleeve is moved in the first position thereof.

5. A method of producing crude oil, wherein crude oil production is enhanced by injecting lift gas into the production tubing by means of the method according to anyone of claims 1-4.

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6. A gas lift flow control device for injecting lift gas or other fluid into a production conduit of an oil well, comprising:

- a tubular valve housing comprising a flow passage having an upstream end which is configured to be connected to a lift gas supply conduit and a downstream end which is configured to be connected to the interior of the production tubing;

- a flapper type valve body which is pivotally connected to the valve housing and is arranged in the flow passage such that if the valve body is pivoted in the open position the valve body is oriented substantially parallel to the flow passage and that if the valve body is pivoted in the closed position the valve body is oriented substantially perpendicular to the flow passage and is pressed against a ring shaped valve seat, thereby blocking passage of lift gas through the flow passage;

- a valve protection sleeve which is slidably arranged in the flow passage between a first position wherein the sleeve extends through the ring-shaped valve seat, whilst the valve body is pivoted in the open position thereof, thereby protecting the valve seat and valve body against wear by the flux of lift gas or other fluids and a second position wherein the sleeve extends through the section of the flow passage upstream of the valve seat, whilst the valve body is pivoted in the closed position thereof; and

- a flow restrictor forming part of the valve protection sleeve, which is dimensioned such that the flux of lift gas flowing through the flow restrictor creates a pressure difference which induces the sleeve to move towards the first position.

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7. The gas lift flow control device of claim 6, wherein
the sleeve has a tapered section where the outer
diameter of the sleeve is gradually reduced in
downstream direction of the sleeve and a first flexible
5 sealing ring is arranged in the housing upstream of the
valve seat, such that the outer surface of the tapered
section of the sleeve is pressed against the inner
surface of the sealing ring when the sleeve is in the
first position thereof, thereby providing a fluid tight
10 seal in the annular space between the tapered section of
the sleeve and the tubular valve housing when the sleeve
is in the first position thereof and such that said
first sealing ring only loosely engages the tapered
section of the sleeve when the sleeve is in the second
15 position thereof.

8. The gas lift flow control device of claim 6, wherein
the tubular valve housing has a tapered section where
the inner diameter of the housing is gradually reduced
in downstream direction of the housing, and wherein a
20 first flexible sealing ring is arranged on the outer
surface of the sleeve, such that the inner surface of
the tapered section of the housing is pressed against
the outer surface of the sealing ring when the sleeve is
in the first position thereof, and such that said first
25 sealing ring only loosely engages the tapered section of
the housing when the sleeve is in the second position
thereof.

9. The gas lift flow control device claim 6, wherein a
second flexible sealing ring is arranged in the tubular
30 housing downstream of the first sealing ring, which
second sealing ring is configured as a stop for the
sleeve when the sleeve is moved in the first position
thereof.

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10. The gas lift flow control device of claim 9 and 7 or 8, wherein the first and second sealing rings are made of an elastomeric material and define an sealed annular enclosure in which the flapper valve body and seat are
5 arranged when the sleeve is moved in the first position thereof.

11. The gas lift flow control device of any one of claims 6 to 10, wherein the flapper valve body is equipped with a spring which biases the valve body towards a closed position and wherein a spring is
10 arranged between the tubular valve body and the valve protection sleeve, which biases the valve protection sleeve towards the second position.

12. The gas lift flow control device of claim 11,
15 wherein the device is configured to be retrievably positioned in a substantially vertical position in a side pocket in the production tubing of an oil well, and the spring which biases the valve protection sleeve towards the second position is configured to collapse if
20 the accumulation of the gravity of the valve protection sleeve and forces exerted by the lift gas to the sleeve exceed a predetermined threshold value.

13. The gas lift flow control device of claim 12,
25 wherein the spring is configured to collapse when the lift gas injection pressure has reached a value which is lower than the lift gas injection pressure during normal oil production.

14. The gas lift flow control device of any preceding claim, wherein the flapper type valve body comprises a tilted face which is dimensioned such that the point of initial contact by the sleeve when moving from the second position to the first position is a the point
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farthest away from a hinge pin of the flapper type valve body.

15. The gas lift flow control device of claim 7, wherein
taper angles of the tapered section of the housing and
5 the sleeve are selected such that the sleeve is
centralized within the housing as the flapper type valve
body moves to the open position.